Carleton University Cognitive Science Student Conference 2026

Abstract Booklet

Friday, April 10, 2026

Richcraft Hall, Carleton University

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WiCSC+ CVs & Summer Research Experience Workshop

WiCSC+ Trainee Board

Room No: RB 2228

10:00-10:45

The WiCSC Trainee Board workshop covers summer research programs, including NSERC USRA, CUROP, and FSWEP, and provides practical tips and strategies for applying. Student panelists will share their experiences, highlighting how these opportunities can develop skills and create pathways to future research and career opportunities.

Talks Session 1

RB 2228

11:15-12:45

Synesthetic Dimensions

Mitchell Ross, Carleton University

Room No: RB 2228

11:15 – 11:20

Research on synesthesia in the field of cognitive science has recently begun to reinterpret the phenomenon considering new evidence. Seminal theories and membership criteria first introduced in the mid-to-late 20th Century portrayed synesthesia as an inherited and categorical trait. Over the past few decades, however, the adoption of these strict criteria has resulted in selection biases for synesthesia variants that meet them cleanly, namely, grapheme-color synesthesia. Reports from self-identifying synesthetes across multiple rarer variants showcase the flexible nature of synesthetic experiences unaccounted for by seminal models. Recent behavioral and neural evidence also points to the need for a more flexible and sensitive model. Some researchers are now calling for revaluation of membership criteria. My project answers this call by introducing a new dimensional model of synesthesia. I first lay out evidence suggesting the need for a new model, then demonstrate the suitability of dimensional models in fleshing out our understanding of synesthesia generally. Next, I outline putative dimensions to be included within the new model. Lastly, I propose to create an application that makes use of dimensional models to characterize individual synesthete profiles and track synesthetic experiences. Such a widely available application could in principle close the gap in the quantity of reports between common and rare variants, alleviating the current selection bias, and providing researchers with more comprehensive data to inform their understanding of synesthesia as a cognitive phenomenon.

Alert, Aware, or Overwhelmed? How Stress Shapes Human Responses to Takeover Requests

Chloé Lachance-Soulard, Carleton University

Room No: RB 2228

11:20 – 11:25

With the rise of semi-autonomous vehicles populating the roads, where drivers must be ready to take over control of the vehicle when using its autonomous features, it is important to examine and understand the factors impacting takeover success. Increased automation means drivers can be fully immersed in another task while the car is driving itself, making it vital for takeover alerts to successfully redirect attention back to the driving task when autonomous features fail. The present study investigated the effects of alert salience and modality on stress elicited during takeover events in multi-tasking drivers using semi-autonomous vehicles, and how these stress responses impact takeover success. Using a virtual reality driving simulator, participants completed nine test drives in semi-autonomous mode. During each scenario, participants engaged in a non-driving related secondary task and at a predetermined point during the drive, they were prompted to take over control of the vehicle by the emergence of a takeover alert. Results indicate that manipulating salience differentially affected physiological stress responses in a modality-specific manner, with auditory salience producing significant changes in arousal whereas visual salience did not. Results also indicate significant differences in perceived stress levels when manipulating alert salience in both modalities. The present research is important for the development of effective takeover alerts that ensure a safe transition from autonomous to manual mode in semi-autonomous vehicles.

Exploring Cognitive Reserve in Adults with Acute and Chronic Hearing Loss Using Multi-Modal MRI

Imola MacPhee, Carleton University

Room No: RB 2228

11:25 – 11:40

Aging and chemotherapy are both linked to sensory and cognitive changes, including hearing loss, cognitive decline, and structural alterations in the thalamus and hippocampus. Both the thalamus and hippocampus contain subregions with distinct anatomical and functional properties, yet are typically described as whole structures in neuroimaging studies. Here, we move beyond whole-structure analyses by examining thalamic nuclei (THOMAS), hippocampal subfields (HippUnfold), and gray- and white-matter microstructure (NODDI) to reveal patterns that support hearing and cognitive function.

We analyzed cross-sectional data from 80 adults, including 26 young adults (18–30 years), 24 older adults (≥60 years), 16 middle-aged adults with a history of chemotherapy exposure, and 14 healthy controls. Participants completed assessments of hearing (pure-tone audiometry and speech-in-noise perception using QuickSIN), cognition (MoCA and Shipley-2), and cognitive reserve (CRIq). MRI data were acquired at 3T using T1-weighted and diffusion sequences.

Using a combination of univariate and multivariate statistical approaches, preliminary analyses demonstrate that total hippocampal and thalamic volumes decrease with increasing age and greater hearing difficulty. Subfield- and nucleus-level analyses revealed differential patterns of association across hippocampal subfields and thalamic nuclei, as well as group-specific variation in NODDI-derived microstructural measures. Together, these results suggest that age, hearing loss, and chemotherapy exposure are associated with distinct alterations within thalamic–hippocampal circuitry and cognitive change.

These findings advance our understanding of how aging, hearing loss, and chemotherapy affect brain systems supporting cognition and audition. Ultimately, this work provides a framework for evaluating neural markers that may be sensitive to intervention in individuals with hearing loss.

Other Authors: John Anderson

Employing Linguistic Tasks and Event-Related Potentials to Investigate Schizotypy, Autistic Traits, and Bilingual Cognition

Arthur Hamilton, Carleton University

Room No: RB 2228

11:40 – 11:55

Schizophrenia and autism spectrum disorder are associated with language deficits. Traits characteristic of each condition also exist subclinically in the general population on continua, called schizotypy and autistic traits. It is less studied whether these subclinical traits are associated with language deficits, and it remains unknown whether this association differs between bilinguals' native language (L1) and non-native language (L2). Here I describe two experiments, one completed and one planned, designed to address these questions. Experiment 1 was a large (N = 962), behavioral study in which neurotypical participants completed tasks in both English and French, spanning four linguistic domains: lexis, semantics, syntax, and pragmatics. Participants' levels of schizotypy and autistic traits were then assessed through questionnaires. Participants higher in schizotypy were less accurate across linguistic domains, while participants higher in autistic traits were less accurate specifically in pragmatics. On the lexical task, schizotypy was also associated with reduced L1/L2 differences in accuracy. Experiment 2 will examine the same four linguistic domains but analyzed through event-related potential components obtained through electroencephalography, namely the N400 and P600. The amplitudes of these components are sensitive to experimental manipulations in these four linguistic domains, but less so in schizophrenia and autism spectrum disorder. Their relationship with schizotypy and autistic traits will be assessed for L1, L2, and L1/L2 differences. Together, these two experiments will provide behavioral and electrophysiological evidence on the association between subclinical symptoms and language deficits, with potential implications for the broader relation between cognitive deficits and dimensional models of psychopathology.

Other Authors: Synthia Guimond, Olessia Jouravlev

BioHAM: Biologically Plausible Hierarchical Associative Memory

Connor Hanley, Carleton University

Room No: RB 2228

11:55 – 12:00

Dense Associative Memories, or Modern Hopfield Networks provide a powerful framework for understanding content-addressable memories. However, Modern Hopfield Networks are not biologically plausible as they require many-body interactions. Previous work has shown that one can construct an entirely local, and hence biologically plausible, form of Dense Associative Memory. Likewise, even traditionally non-local functions used in Dense Associative Memories involving contrastive normalization can be reformulated using entirely local operations. This work proposes to continue this project, providing a framework for implementing Hierarchical Associative Memories using entirely simulated spiking neurons. Biologically plausible Hierarchical Associative Memories provides a powerful tool for computational cognitive science and neuroscience.

A Wedge in Perception: Bilingual Advantage in the Detection of Coarticulation Violations

Anna Cole, Carleton University

Room No: RB 2228

12:00 – 12:15

Infants possess heightened sensitivity to the acoustic properties of language, enabling superior speech discrimination across different languages. Over the course of development, monolingual infants undergo perceptual narrowing, whereby auditory speech processing becomes specialized for their native language. By contrast, bilingual infants retain perceptual sensitivity, laying the foundation for the Perceptual Wedge Hypothesis. This theory proposes that exposure to multiple languages modulates perceptual narrowing, thereby increasing phonological sensitivity.

Existing literature on the Perceptual Wedge Hypothesis has primarily focused on infants and toddlers. However, little is known about the extent of this perceptual advantage or whether it persists into adulthood. In an ERP experiment, I investigate differences in phonological processing between English monolinguals and native English speakers proficient in a second language.

The experiment employs an auditory adaptation paradigm to measure both behavioural responses and the mismatch negativity (MMN) ERP component. Participants listened to sequences of speech sounds and indicated whether the final sound deviated from the preceding sounds.

Experiment

Participants were presented with English words manipulated through cross-splicing. The words differed only in their final consonants (e.g., neck vs. net). Cross-spliced stimuli were created by swapping onset–nucleus segments, resulting in words with incorrect phonological representations (e.g., “ne” from neck merged with “t” from net). Sequences ended with either a correctly produced word or an incorrect, cross-spliced word, and participants judged whether the final sound differed from the preceding ones.

Findings

Behavioural performance was comparable between monolinguals and bilinguals; however, the groups differed in their neural responses. Specifically, ERP analyses revealed group differences in MMN magnitude. These findings suggest that bilingual exposure enhances sensitivity to subtle speech differences that are not common in one's native language.

Other Authors: Olessia Jouravlev

Spikes' Code Color: Neural Model of Attention Interference

Natalia Gomez, Carleton University

Room No: RB 2228

12:15 – 12:20

This study replicates a spiking computational neural model from Caron & Stewart (2020) in the neural simulator Nengo that simulates attentional processes in the Stroop task. Model response times are compared to empirical data. The model was configured based on the a forementioned paper to test human attention mechanisms via neural simulations. The behaviour that emerges from those simulations, such as response times and accuracy, is measured and compared with human Stroop performance. Model parameter modifications will be made as necessary to fit the behavioral data, and these configurations may be compared with the neuroscientific data on the Stroop test (time permitting). If the empirical evidence is compatible with the outputs of the cognitive model, then the cognitive model is believed to explain the mechanics of attention in the Stroop task for the selected sample of data. With successful model replication and comparison, I hope to provide clarity on the mechanics of attentional control, using the Stroop task as an example.

Other Authors: Mary Kelly

Neurocognitive Mechanisms of Code and Language Processing: An ERP Approach

Mary Nehmé, Carleton University

Room No: RB 2228

12:20 – 12:35

While natural language processing in the brain has been extensively studied, much less is known about the neural mechanisms underlying programming language comprehension. Recent research suggests that programming and natural languages share some cognitive and neural processing mechanisms (Prat et al., 2020). However, the extent of their overlap remains debated. This study investigates the neural correlates of syntactic and semantic processing in both natural and programming languages, using event-related potentials (ERPs). Specifically, we examine the N400 effect, an index of semantic processing difficulty (Kutas & Hillyard, 1983), and the P600 effect, associated with syntactic reanalysis and repair (Gouvea et. al., 2010).

Method: Participants, all native speakers of English and proficient in Python, read English sentences and lines of Python code. In the natural language condition, sentences were semantically plausible vs. implausible or syntactically correct vs. incorrect. In the programming language condition, participants processed correct and incorrect lines of Python code. Incorrect code contained either semantic anomalies or syntactic. Participants performed acceptability judgments to assess real-time brain activity in response to these violations while their ERPs were recorded.

Results: Semantic violations in natural languages elicited increased N400 amplitudes, reflecting greater cognitive effort in meaning integration. Syntactic violations, on the other hand, generated P600 effects, indicative of reanalysis and syntactic repair processes. However, the magnitudes of effects were reduced in the programming vs. natural language.

Conclusions: Differences in magnitudes of the ERP effects for the programming language are likely due to (a) the more rigid and less ambiguous nature of programming syntax and (b) due to the fact that variable names and identifiers do not inherently carry meaning in the same way as natural language words

Other Authors: Masih Zaamari, Olessia Jouravlev

From Steering to Screening: Predicting Mature Driver Health Status from Driving Data

Tal Friedman, Carleton University

Room No: RB 2228

12:35 – 12:40

Low-mileage mature drivers are a high-risk group, and issues that affect their driving ability are often only recognized after serious incidents involving injury or death. Changes in health can be directly tied to altered decision-making and worsened driving skills, such as making left-hand turns. Thus, it may be possible to analyze driving data to estimate a given drivers' health status. Multiple types of machine learning models such as random forests and XGBoost have achieved up to 94% success rates when predicting health conditions (Alzheimer's, ADHD) from driving data. The Candrive-II dataset, which includes longitudinal health assessments (ranging from 1 to 7 years) and individual vehicle data from 793 mature drivers from Canadian sites, is sufficient data to utilize machine learning techniques to predict driver status on a wider range of health constructs. The Candrive health information is robust in scope and fidelity, including dozens of individual assessments across the three main domains of driving-related health: cognition, vision, and physical health and function. This work involves constructing composite health domain scores based on the Candrive assessment battery using latent class analyses. Once separate health classes are assigned to drivers, a range of machine learning classifiers will be trained on driving data to predict class membership. Outcomes will clarify which components of health and driving data are useful and necessary for accurate health class prediction. Applying the best models to mature drivers' data can provide them with early warnings regarding negative trajectories concerning their cognitive, vision, or physical health.

Other Authors: Chris Herdman, Kathleen Van Benthem

Talks Session 2

RB 2224

11:15-12:45

Clarifying Metacognition as a Skill Domain

Brendan Conway-Smith, Carleton University

Room No: RB 2224

11:15 – 11:30

This research advances the understanding of metacognitive skill by positioning it as a distinct domain of expertise, analogous to motor and cognitive skill domains. Drawing from frameworks in skill acquisition and dual-process theories of metacognition, it highlights shared principles such as goal-directed action, hierarchical organization, and the interaction between declarative and procedural knowledge. This research outlines how metacognitive skill develops from deliberate, instruction-based actions to automatic, proceduralized responses, emphasizing its gradability in terms of success rates, goal breadth, and adaptability. Additionally, it explores metacognitive subdomains, including attentional control and emotional regulation, demonstrating their alignment with broader skill principles. Through a synthesis of theoretical and empirical research, this work articulates how metacognitive knowledge structures, such as metarepresentations and internal models, guide action selection and control. This framework clarifies the unique characteristics of metacognitive skill and its potential for improvement through targeted training, offering implications for education, therapy, and self-regulation practices. By establishing metacognition as a structured skill domain, this research contributes to a unified theory of metacognition and informs future studies on skill acquisition and cognitive self-regulation.

A Spiking Neural Network Model of Cognitive Control in the Stroop Task

Nicolas V. Turcas, Carleton University

Room No: RB 2224

11:30 – 11:45

We present a biologically plausible spiking neural network model of the Stroop color–word interference task that addresses three open questions in computational cognitive neuroscience: how trial-by-trial cognitive control adaptation emerges from neural dynamics, what parameter constraints support viable control, and how aging-related neural changes impair executive function. The model is implemented with spiking Leaky Integrate-and-Fire (LIF) neurons in the Nengo simulation framework using the Semantic Pointer Architecture (SPA). The architecture incorporates a two-path parallel evidence extraction mechanism and an ACC–DLPFC–attention feedback loop for conflict-driven control adaptation. Four experiments were conducted with 50 independent network instantiations each to capture stochastic neural variability.

The model reproduces the canonical Stroop interference effect (46.5 ± 34.3 ms) with near-ceiling accuracy (99.8%). Under repetition-free conditions, it produces a significant Gratton effect (+36.5 ms, $p = .012$), which collapses under standard conditions with feature repetitions (+2.9 ms, $p = .850$), offering a computational explanation for why repetition-free designs are critical for isolating cognitive control from priming effects. Simulations of aging show that functional dedifferentiation significantly increases interference ($p = .009$), while structural damage affects behavior only when synaptic compensation is unavailable ($p = .002$), with dedifferentiation amplifying vulnerability to damage (interaction $r = .892$, $p = .003$).

Together, these findings provide computational constraints on theories of cognitive control, conflict adaptation, and cognitive aging, and offer a principled framework for understanding individual differences in executive function across the adult lifespan.

Altered Functional Connectivity in Age-Related Hearing Loss: A Neurosynth-Based Analysis

Maya Shaban, Carleton University

Room No: RB 2224

11:45– 11:50

Age-related hearing loss -also known as presbycusis- is one of the most common progressive sensory disorders affecting older adults. Previous studies of age-related hearing loss (ARHL) have focused on structural changes and how it differs from healthy aging. It remains unclear whether hearing loss reflects primary neuroanatomical degeneration associated with cognitive decline or whether a lifetime exposure of sounds drives cognitive decline.

This study investigates functional brain differences and connectivity patterns in individuals with ARHL. We hypothesize the stronger the hearing loss is in individuals with ARHL, the more pronounced change in functional activation of the brain. Using Neurosynth-based meta-analytic mapping, we generated whole-brain activation maps demonstrating patterns of functional changes correlated with ARHL severity. These findings contribute to understanding the relationship between age-related hearing loss and cognitive decline through functional brain reorganization.

Examining the effects of perceived authorship and academic domain on learning in the context of AI-generated content

Ian Darragh, Carleton University

Room No: RB 2224

11:50 – 12:05

The prevalence of ChatGPT and other large-language models (LLMs) in the world of education is something that both teachers and students are concerned about. Some students use LLMs to summarize educational content or to write essays for them, which limits their learning potential by reducing the amount of student engagement with learning materials. Perceptions of AI-generated content may affect if and how students use these tools, both in terms of how they process and study information from them. Certain domains such as programming may be perceived as more AI-friendly as well, further influencing perceptions of AI when learning in those domains. In this study, we investigate how perceived content authorship affects learning from instructional texts across two cognition-related domains: cognitive neuroscience and machine learning. Participants read two instructional texts, one on each topic, in a random order and answered pre- and post-test questions relating to the text. Each participant was informed that one text was authored by ChatGPT, while the other text was excerpted from a textbook. After reading the texts, participants answered a questionnaire on their attitudes towards ChatGPT. We report on how belief in the source of materials (ChatGPT or human), domain (cognitive neuroscience and machine learning), and attitudes toward AI influenced learning from pre-test to post-test.

Other Authors: Kasia Muldner

How Efficient are Traditional Learning Styles Coping in Modern AI Influenced Classrooms?

Gracia Elika, Carleton University

Room No: RB 2224

12:05 – 12:10

For the longest time students have been taught various learning styles and have adopted these strategies based on their preference. With the sudden and ever expending trends in technology, efficiency of these traditional learning styles in our current era is to be reevaluated.

The new adaptive learning systems are meant to deliver a personalized learning adjusted to individual student's performance. As well as feedback to create a data enforced learning process for students.

AI should be used as a support for learning and not to avoid intellectual efforts. In other words, modern schools should no longer rely on fixed categories of students. Instead, it should offer multiple ways of learning: text, images, videos, exercises, discussions immediate feedback and adaptation to a student's level. This is what a more flexible, personalized and responsive pedagogy looks like.

UNESCO, for its part, reminds us of that AI must remails at the service of human beings. This means that technology should develop a student's abilities and not replace them. Learners must learn how AI works, what it can do, risks and limitations, and their responsibilities.

So, in direct terms, the main issue in AI-classrooms is not whether a student learns "through the eyes" or "through the ears". What matters the most is ensuring that the students remain active and understand what they are doing, think seriously and use AI intelligently.

What Did I Just Count? Memory's Relationship with Cardinality

Kyla Allan, Carleton University

Room No: RB 2224

12:10 – 12:15

This research takes part within an international multi-lab collaborative study called Many Numbers. Within this project with the data I collected, I address the relationship between measures of cardinality to executive functioning skills. Cardinality is acquired when a child understands that the last number said when counting objects represents how many objects there are in that set. A standardized task to measure cardinality is the Give-A-Number task (Give-N). The Give-N task allows researchers to classify a child as either a cardinal principle (CP)-knower or a subset (SS)-knower based off the highest number the child can reliably create, count, and label a set of objects. During the Give-N task, a key component is that a child has to remember the last number they said and keep track of which objects they have already counted. This place demands on the child's executive functions, particularly working memory. I hypothesize that due to the executive function demands of the Give-N task, children with low working memory who are classified CP-knowers will show errors in larger number trials (eight and ten) of Give-N. CP knowers with high working memory will display higher accuracy on the same trials. I believe my results will reflect that there is a positive relationship between performance on Give-N and visual working memory when controlling for age. By establishing a positive relationship between these variables, researchers and educators can address how children learn number and what skills influence mathematic achievement.

Other Authors: Rebecca Merkley

Comparing Digital and Paper Formats of an Early Numeracy Screener

Sarah Kelly, Carleton University

Room No: RB 2224

12:15 – 12:20

Are paper and digital formats of math assessments equivalent? When researchers compare students' answers in the two presentation formats, results vary from significant differences to no differences. The goal of this research is to determine if differences occur in student performance between paper and digital versions of a numeracy math assessment. Assessments are completed a month apart, once in each format by Grade 3 students.

There are four hypothesized factors that may affect student responses. First, difficulty of the question, where easier and harder questions may have a lower correct response rate in a digital format compared to paper. Second, time limits used with fluency tasks may cause differences between formats. Third, students' cognitive strategies may be influenced by format and students being unable to annotate questions may impact accuracy in the digital format. Fourth, students' skill level may interact with the format of the assessment.

Results from the paper version and the digital version for each student will be compared as well as looking at overall results from the group. This research will help shed light on whether performance differences are evident between formats. It is important to know if the format of the tool being used is affecting student outcomes in detrimental ways. The findings from this research will help establish a better understanding of how to maintain equivalence between paper and digital formats and what factors should be closely considered when taking an assessment from one format to the other.

Other Authors: Michael Slipenkyj, Heather Douglas, Rebecca Merkley, Jo-Anne LeFevre

Can LLMs Deliver Mastery-Based Instruction? Designing and Evaluating a Prompt-Guided Tutor for Novice Programmers

Olga Manakina, Carleton University

Room No: RB 2224

12:20 – 12:35

Mastery learning is a proven instructional strategy, yet its traditional classroom implementations rely on coarse-grained assessments that limit adaptability to individual student needs. Intelligent tutoring systems offer fine-grained knowledge tracing but require substantial development effort. Our paper explores whether large language models (LLMs) can enable a lightweight approach to mastery-based instruction for introductory programming. We designed an LLM-based tutor targeting code tracing, a fundamental skill in which learners predict program behavior by mentally simulating its execution. The tutor operates as a prompt-configured custom LLM, where mastery-learning behaviors including progression logic, feedback policies, and remediation protocols are defined entirely in a set of instructions provided in the system prompt.

We conducted experimental sessions with novice programming students to assess the tutor'sadherence to its instructional design across several dimensions: mastery-based progression, quality of generated practice problems, accuracy of student performance assessment, and appropriateness of remediation. We also administered a post-session survey to evaluate user experience, including engagement, motivation, and willingness to use the tutor again. To systematically analyze tutor behavior, we developed an LLM-assisted data extraction pipeline. Raw HTML conversation logs were first transformed into consistently formatted text using structured prompts, then we converted text files into structured JSON representations, extracting metric-aligned data. Human verification of approximately 30% of the extracted outputs against source transcripts confirmed the accuracy of this approach. Our findings indicate that the tutor behaved consistently with its specified mastery-learning design in the large majority of interactions, and students reported highly favorable experiences with the system.

What Would it Take to Have Theory of Mind?

Eilene Tomkins-Flanagan, Carleton University

Room No: RB 2224

12:20 – 12:35

Contemporary artificial intelligent agents struggle with theory of mind tasks, and tend to succeed only where they can memorize similar answers in advance. From a safety point of view, this failure is particularly concerning. In order to be safe, another agent must at least be able to behave in a way that does not do things you would rather they didn't, even if avoiding undesirable action is an obstacle to their success, like kicking your dog on the way to the coffee machine. Understanding what you would rather other agents not do is a quintessential theory of mind task, but it is not clear how artificial intelligent agents might solve it. I frame theory of mind as a task where the job is to validly infer counterfactuals about another agent's propositional attitudes (namely, their beliefs, desires, and intentions). I then propose a theory of mind inference "game" that formalizes it as an inverse reinforcement learning task. With some further characterization of propositional reasoning, how AIs reason now, and how it differs, I conclude by proposing a possible solution to the theory of mind game.

Poster Session 1

Atrium

13:00-14:00

Effect of Medium on Learning and Strategy Selection in Code Tracing

Caitlin Creaser, Carleton University

Room No: Atrium, Poster Session 1, Poster 1

13:00 – 14:00

Code tracing involves simulating the high-level steps a computer takes when it executes a program, including tracking the current values of variables along with which lines of code are executed in each iteration. Code tracing is a foundational skill needed for learning programming but also one that students find challenging to learn. This between-subjects study (N = 88) examined the effect of medium (paper, tablet, laptop) on learning and strategy selection. Prior work has shown that students use various spatial representations for code tracing like tables and crossing out outdated values. Although, these studies only used paper as a medium. This study tests the effect of medium using qualitative methods to analyze the completeness, correctness and strategies used in each medium.

Other Authors: Kasia Muldner

Extending Computational Models of Mental Rotation Through Axis Identification

Rachael Mohl, Carleton University

Room No: Atrium, Poster Session 1, Poster 2

13:00 – 14:00

Mental rotation is essential for daily functioning and various higher-level cognitive tasks. Though experimental data is vast, there are few computational models of mental rotation that can reproduce human results, and only a small subset of these models outline the specific cognitive steps involved in mental rotation. Furthermore, these models that outline a cognitive process share representational limitations; they (1) do not address how an initially unknown axis of rotation is identified, (2) do not address the possibility of misperceived axes of rotation, and (3) do not replicate mental rotation tasks that require simultaneous rotation around a combination of cardinal axes. I propose a theory that provides a detailed explanation of how the mind carries out this complex process, and will implement a computational model that uses this theory to approximate human results when attempting Shepard and Metzler's mental rotation decision task.

How Language Rewires Face Perception

Caressa van Walraven, Carleton University

Room No: Atrium, Poster Session 1, Poster 3

13:00 – 14:00

Human face perception relies on configural processing, our ability to recognise a face by the spatial layout of its features. While considered a biological universal, evidence suggests language experience may reshape visual attention. Managing multiple phonological systems might encourage multilinguals to distribute attention more broadly across faces. However, it remains unclear whether these differences reflect a fundamental neural shift or a flexible adjustment across individuals.

To address this, we examine how multilingualism affects face-processing strategies. We are recruiting 70 Arab adults from Ottawa, divided into monolingual and multilingual groups, for a face-recognition task. Using the face-inversion paradigm, we employ eye-tracking to map fixation changes between upright and inverted faces. We then use EEG to measure the N170 component, a brain wave linked to early face detection, to see how language background influences the Other-Race Effect (ORE), the tendency to recognise own-race faces faster than other-race faces. Previous work on the ORE suggests that bilinguals are not susceptible to this effect, though its extent has not been investigated.

We expect that multilingual adults exhibit broader visual scanning and more bilateral neural activity while monlinguals exhibit right-lateralized, eye-centric configural processing. We also expect that multilinguals will have slower reaction times in face processing, and will not exhibit the Other-Race Effect, contrary to monolinguals. An exploratory comparative phase with canines further tests whether these attentional patterns reflect human-specific linguistic experience or a broader mammalian baseline. Ultimately, these findings will clarify how linguistic environments shape the underlying mechanisms of social perception.

Other Authors: Olessia Jouravlev

Thinking Twice: The Interplay Between Repetition, Need for Cognition, and the Illusory Truth Effect

Kyla Allan, Anna Cole, Rebecca Ferguson, Olivia Holm, Carleton University

Room No: Atrium, Poster Session 1, Poster 4

13:00 – 14:00

The illusory truth effect (ITE) is a phenomenon describing the influence of repetition on the acceptance of known falsehoods. Despite being well studied, much of the focus is centred on content-based factors, with little attention paid to individual differences in cognitive traits and how they may alter susceptibility to the acceptance of known falsehoods. We investigated whether need for cognition (NFC), a trait that reflects one's tendency to engage in elaborative thought, moderates' susceptibility to the ITE. Without specifying a direction, we hypothesized that the strength of the ITE would vary depending on an individual's level of NFC. The experiment consisted of a single online session wherein participants were administered a series of questionnaires that were presented in the form of an interest-rating and a truth-rating scale. This facilitated the presentation of repeated and non-repeated statements thought to be unknown by the general population (e.g. Picasso is the artist who painted "Guernica"). Data was provided to the authors from their CGSC 3908 professor. The results revealed that those who scored high in NFC showed greater susceptibility to the ITE, thereby emphasizing the importance of exploring cognitive characteristics in relation to susceptibility to repeated falsehoods.

Other Authors: Olessia Jouravlev

A Representational Language for a Database of Artificial 3D Spatial Memories

Rebecca Henry, Carleton University

Room No: Atrium, Poster Session 1, Poster 5

13:00 – 14:00

Spatial memories are fundamental to cognition, supporting functions such as navigation, imagination, and orientation. The constraints, components, and nature of spatial memories have been extensively studied, though no representational language to describe them comprehensively exists, nor does a database of spatial memories. Such a language would consolidate existing theories of 3D spatial memory, offering a method to formally represent them. With this language, a database of 3D spatial episodic memories could be generated. This database could support future research in the field of spatial cognition, and it could act as a reflection of the current theories of spatial memory. The database will be synthetically constructed to increase efficiency and enable scalability. The representational language will be described to an LLM, instructing it to generate tens of thousands of artificial spatial memories. A manual evaluation on a sample of the database will measure how well the LLM followed the instructions, and inspect the quality of the artificial spatial memories

Other Authors: Jim Davies

The Syntax of Ergative Languages

Chester Leopold, Carleton University

Room No: Atrium, Poster Session 1, Poster 6

13:00 – 14:00

Every fluent speaker of English, including young children, subconsciously knows to pronounce the objects of transitive sentences, such as "him" in (1) as morphologically marked. We also know to pronounce the subjects of transitive sentences as morphologically unmarked. We know that sentence (1) below sounds well-formed and that (2-3) sound ill-formed: (1) He saw him. (2) *He saw he. (3) *Him saw he.

We know this without receiving much or any explicit corrective training from our parents during acquisition. Yet had we grown up in an a culture that speaks an ergative language, such as Basque, we would have learned the reverse rule for pronouncing case.

In Basque, the morphological marker "-k" is added only to the subjects of transitive sentences while the objects of transitive verbs are left morphologically unmarked.

(4) Nekane-k Miren eta Jon ikusi ditu

N.ERG M.ABS and J.ABS seen aux.3pl ABS.3s ERG

"Nekane saw Miren and Jon".

Our innate capacity to acquire any language, (universal grammar) is consistent with our learning either kind of case system– ergative, (Basque) or nominative/accusative, (English). Though linguists haven't reached a consensus for how to formalize our knowledge of these rules. In my presentation, I analyze three approaches to case assignment from Milan Rezac, Amy Deal and Noam Chomsky. I support Chomsky's claim that humans have the same capacity to combine words into syntactic objects. However, the above cross-linguistic variation in case assignment can be described as paramaterized rules for how to "externalize" products from our shared faculty of language.

Staying Alert in Autopilot: The Effects of Trust in Automation and Attentional Capacity on Situation Awareness in Novice and Senior Drivers

Sadia Naureen, Carleton University

Room No: Atrium, Poster Session 1, Poster 7

13:00 – 14:00

Semi-autonomous driving systems are increasingly more prevalent on today's roads, yet their effectiveness depends on drivers' trust and their subsequent ability to maintain situational awareness while interacting with automated features. Both under-trust and overreliance on automation may compromise drivers' monitoring of the simulated driving environment, particularly among novice drivers who may have limited real-world experience. This study investigates how trust in automation, automation failures, and situational awareness jointly influence driving behaviour during semi-autonomous driving. Licensed drivers with fewer than five years of experience will complete a laboratory session involving multiple simulated 2D drives with adaptive cruise control and programmed automation failures. Participants will complete measures of trust in automation, workload, situational awareness, and technology readiness. During each drive, they will monitor and steer on the roadway, be notified of system messages, and identify hazards. By examining individual differences in trust, technology readiness, and previous experience with semi-automated features, this study seeks to understand the cognitive mechanisms underlying automation use in novice drivers. Findings are expected to contribute to the efforts to inform the development of future automated systems to optimize the trust of some of the most vulnerable drivers in Canada.

Other Authors: Kathleen Van Benthem, Chris Herdman

Depression and the Allocation of Cognitive Effort in Language Comprehension

Akshaya Kirithy Baskar, Carleton University

Room No: Atrium, Poster Session 1, Poster 8

13:00 – 14:00

Major depressive disorder (MDD) has been linked to alterations in motivation, cognitive control, and sustained attention, yet its influence on naturalistic reading behavior remains unexplored. The present study investigates whether depressive symptoms are associated with differences in reading speed, effort allocation, and sustained engagement during continuous text processing. In this study, 34 participants with elevated depressive symptoms, and 34 matched controls completed a story-reading task, while eye tracking was performed. The task embedded within a broader cognitive assessment of vocabulary, grammar, and nonverbal IQ. This design enables us to disentangle language ability from engagement-related processes indexed by eye movements and pupil dilation.

We propose to examine whether depressive symptoms predict overall reading speed, within-subject variability in fixation durations, and rereading frequency, while statistically controlling for individual differences in language and cognitive skills. In parallel, task-evoked pupil dilation is being analyzed as a physiological marker of effort allocation. Two competing possibilities are under consideration: 1) Depressive symptoms may be associated with reduced dilation, reflecting blunted engagement, 2) increased dilation, reflecting greater perceived effort required to maintain comparable performance.

We are further exploring whether symptom severity interacts with textual difficulty, such that linguistically demanding regions amplify potential group differences in processing dynamics. By integrating behavioral, ocular, and cognitive measures, this study aims to clarify whether observed differences in reading behavior reflect altered cognitive capacity, changes in effort mobilization, or variability in sustained engagement. This approach may offer new insight into how depression shapes real-time language comprehension in everyday contexts.

Other Authors: Nadine Charanek, Olessia Jouravlev

Technology Readiness in Mature Drivers: Implications for Advanced Driver Assistance Systems Engagement

Lexy St Pierre, Carleton University

Room No: Atrium, Poster Session 1, Poster 9

13:00 – 14:00

Older drivers experience age-related cognitive changes that can impact driving performance, particularly in situations requiring attention, rapid decision-making, and interaction with in-vehicle technologies. Advanced Driver Assistance Systems (ADAS) have been shown to reduce driving errors and prevent accidents by introducing automation that supports the driver, however, the safety benefits of these systems depend in part on drivers' adoption and understanding of system functionality. Despite growing adoption of ADAS, little research has examined how mature drivers understand these technologies and how individual differences influence these processes.

The present study investigates the role of technology readiness in shaping older drivers' mental models of ADAS, using the Technology Readiness Index (TRI) as a framework for understanding attitudes toward technology. Structural equation modeling is employed to examine the relationships between technology readiness dimensions and ADAS understanding. It is expected that higher levels of overall technology readiness will be associated with stronger and more accurate understanding of ADAS.

By integrating psychological constructs of technology readiness with human factors perspectives on mental models, this research addresses a gap in the ADAS literature regarding mature drivers' understanding of ADAS. The findings have implications for the design of driver assistance systems, targeted training interventions, as well as strategies to support safe and effective ADAS use among an aging driver population.

Other Authors: Kathleen Van Benthem, Chris Herdman

Working Memory and Cognitive Load in Adults with Age-Related Hearing Loss: A Functional MRI Investigation.

Emma Richard, Imola MacPhee, Carleton University

Room No: Atrium, Poster Session 1, Poster 10

13:00 – 14:00

Age-related hearing loss (ARHL) is a risk factor for cognitive decline in older adults. Emerging evidence suggests that sensory degradation may negatively affect higher-order cognitive function, including working memory. The n-back task is commonly used to assess working memory, and prior EEG research has shown poorer n-back performance and reduced neural efficiency in those with ARHL compared to age-matched controls. Here, we use functional MRI (fMRI) to examine the effect of ARHL severity on behavioural and neural responses under increasing cognitive load.

Participants included 43 healthy, right-handed older adults (55-84 years). Hearing was assessed using pure tone audiometry in the standard audiometric range (0.25-8kHz), extended high-frequency audiometry (10-16 kHz), QuickSIN speech-in-noise measures, and self-reported measures using the Hearing Handicap Inventory - Adult/Elderly Screening (HHIE/A-S).

Cognition was assessed using the Rey Auditory Verbal Learning Task (RAVLT), Shipley-2 Vocabulary and Block Patterns Scales, and Montreal Cognitive Assessment (MoCA). Functional MRI data was acquired using numeric 1-back and 2-back paradigms. Data was analyzed using a combination of univariate statistics in R as well as Generalized Linear Modelling (GLM) of the Blood Oxygen Level Dependent (BOLD) signal as implemented in Nilearn.

While data collection and analyses are ongoing, we hypothesize that a greater severity of ARHL will be associated with poorer working memory performance and increased neural recruitment under higher cognitive load. By integrating behavioural performance with fMRI data, this work aims to better understand the neural mechanisms that drive cognitive load in those with ARHL.

Other Authors: John Anderson

Presupposition and Reasoning in Conditionals: A Theory-Based Study of Humans and LLMs

Tara Azin, Carleton University

Room No: Atrium, Poster Session 1, Poster 11

13:00 – 14:00

Presupposition projection in conditional sentences remains a topic of active debate in theories of meaning and pragmatics. One prominent issue is the proviso problem, which concerns whether presuppositions triggered in the consequent of a conditional are interpreted unconditionally or only relative to the antecedent. Despite extensive work in formal semantics, this phenomenon has rarely been examined in evaluations of large language models (LLMs). This paper presents a controlled, theory-based comparison of human and LLM presupposition judgments to investigate how models handle this core aspect of pragmatic inference. We constructed a linguistically motivated dataset of 90 conditional sentences using possessive presupposition triggers, derived from 30 base propositions and systematically varying the logical and probabilistic relevance between the antecedent and the projected presupposition. Using a parallel experimental design, we collected likelihood ratings on a 0-7 Likert scale from 120 human participants and four LLMs, both with and without minimal contextual information. Human judgments proved sensitive to probabilistic relevance and pragmatic plausibility, showing graded projection behavior consistent with accommodation theories, while LLMs showed more variable alignment with human responses across conditions. To probe model behavior further, we conducted an LLM-as-a-judge analysis using a theory-informed checklist based on formal semantic and pragmatic principles, with expert human involvement in both its design and evaluation. Our findings show that models whose outputs most closely resemble human judgments often lacked coherent reasoning. This suggests that their performance may reflect surface-level pattern matching rather than genuine pragmatic competence. Our findings highlight the need for linguistically grounded benchmarks that evaluate not just outcomes, but the reasoning processes behind them.

Other Authors: Yongan Yu, Raj Singh, Olessia Jouravlev

Subjective Cognitive Decline and Neurocognitive Function: A Working Memory fNIRS Study in Younger and Older Adults

Mazzy Beasley, Carleton University

Room No: Atrium, Poster Session 1, Poster 12

13:00 – 14:00

Subjective Cognitive Decline (SCD) is a self-reported degradation of cognitive systems. Recently, SCD has evolved into a possible early marker on the continuum towards Alzheimer's disease. However, the nature of the association between subjective experience and objective neural vulnerability remains poorly understood. Using compensation-based models of cognitive aging, my study aims to explore the relationship between subjective cognitive decline and altered neural recruitment during working memory tasks. I have collected data from younger (18-35 years) and older (65+ years) adults. Participants completed n-back working memory tasks while cortical hemodynamic activity was recorded using a neuroimaging technique called functional near-infrared spectroscopy (fNIRS). fNIRS allows researchers to track changes in concentrations of oxygenated (HbO) and deoxygenated (HbR) hemoglobin in the prefrontal cortex. This data is later used to illustrate neural activity during the performance of the working memory task. I hypothesized that older individuals reporting SCD will show altered patterns of neural activation in the prefrontal cortex compared to non-SCD and younger individuals. My initial observations suggest that behavioural performance will remain within normative ranges. However, individuals reporting SCD may show increased prefrontal activation under higher cognitive load, which is ultimately consistent with compensatory neural recruitment models. This interpretation supports the prior assessment that SCD reflects early functional changes rather than overt cognitive decline. By integrating subjective report, behavioural performance, and neurophysiological measures with fNIRS, my study aims to advance the understanding of age-related neural adaptation and early vulnerability.

Semantic Association Transfer in Bilinguals

Fengwei Liu, Carleton University

Room No: Atrium, Poster Session 1, Poster 13

13:00 – 14:00

Being able to speak two languages not only changes whom we can talk to, but also shapes how we conceptualize the world. Psycholinguistic research on bilingualism has found shared conceptual representations between languages: Although forms vary across languages, a word pre-activates its translation equivalent, leading to shorter reaction time in lexical decision tasks. Classic models of bilingualism posit cross-language connections on all linguistic levels, including a language-agnostic conceptual space. However, translation equivalents are hardly conceptual equivalents. Some words have language- or culture-specific connotations. For instance, the English dragon refers to a scaly creature, while its Mandarin translation long is connected more with phoenix. Neuroimaging studies have found culture-specific pictures activate words in one language more than the other. I aim to further elucidate bilingual conceptual organization by testing whether language-specific semantic associations transfer to the other language. 30 balanced Mandarin-English bilinguals and 30 English monolinguals will be recruited for an English semantic priming task. Language-specific associations will be extracted using Samll World of Words, a multilingual crowd sourced database of word association responses. After pairing Mandarin words with their translations, I will curate four conditions for 200 cue words: M+E+,M+E-, M-E+, M-E-. ERP and reaction time will be recorded as participants read a cue followed by a target. Given the theory of a (partially) shared conceptual store, I hypothesize that the N400 amplitude in the M+E- condition will be lower for bilinguals than monolinguals. An alternative result would suggest separate representations of certain concepts in each language.

Other authors: Olessia Jouravlev

Poster Session 2

Atrium

14:00-15:00

Scrolling for Science: Children's Sharing in the TikTok Cookie Challenge

Georgia Livingstone, Skyelar Haines, Maia Najm, Carleton University

Room No: Atrium, Poster 14

14:00 – 15:00

Social media gives a glimpse of real-world family interactions. For example, parent-child relationships have been the centre of many TikTok trends. The ‘cookie challenge’, a popular trend, shows a child given two cookies, while one parent has one and the other parent has none. The parents then observe if the child chooses to share one of their cookies with the parent who has none. This trend captures similar demands in typical sharing tasks, where the child must recognize the unequal distribution of resources and then decides to respond. Some children share the cookie, some hesitate, and others choose not to. While although viewers interpreted the trend as a measure of children’s generosity or selfishness, sharing also reflects children’s numerical understanding of quantities; children who can represent quantity more accurately are more likely to share in a fair manner. A content analysis was conducted on the cookie challenge on various features of each video such as age, prompts given, counting behaviours, and so on. We investigated children’s responses when parents use a number prompt compared to a social prompt. By leveraging a large, publicly available dataset our presentation contributes to research about how children make decisions by integrating both numerical and social factors.

Other Authors: Madison Millar, Liza Kahwaj, Rebecca Merkley

Behavioural signatures of dopaminergic variation: A machine learning approach to n-back performance

Hannah Matresky, Jaiden Bachelder, Natalie Tutu, Carleton University

Room No: Atrium, Poster 15

14:00 – 15:00

Working memory is modulated by dopamine availability in the prefrontal cortex (PFC) and follows an inverted-U relationship, with optimal performance at moderate dopamine levels. The COMT Val158Met polymorphism alters COMT activity at the synapse, influencing readily available tonic levels of dopamine. Individuals with a Val/Val genotype show higher COMT activity and lower tonic dopamine, whereas individuals with the Met/Met genotype show lower COMT activity and higher dopamine availability. Using behavioural genotype data from Gravelsins et al. (2021) this project examines whether n-back trial accuracy can predict COMT genotype (Val/Val, Val/Met, Met/Met). With less dopamine availability, Val/Val individuals tend to do poorer on working memory tasks, therefore higher trial accuracy is associated with Met/Met individuals and lower accuracy with Val/Val individuals. We applied a supervised machine learning approach to investigate whether these genotype-related differences in dopamine relate to N-back task performance, as traditional univariate analyses may not capture nonlinear dopamine–performance relationships. Multiple classifiers were implemented in WEKA and were evaluated against a baseline model using accuracy, sensitivity and specificity. However, none of the models achieved performance above baseline, suggesting that working memory performance did not provide reliable behavioural signatures of dopaminergic genetic variation in this dataset.

Other Authors: Mazzy Beasley

Keeping the Mind Moving During Aging

Leah M. Durham, Carleton University

Room No: Atrium, Poster 16

14:00 – 15:00

Introduction: While dementia risk rises with age, cognitive decline is not inevitable. Cognitive reserve and physical activity (PA) are linked to cognition, but how cardiovascular regulation (heart rate) relates to brain activation and functional connectivity remains poorly understood. fNIRS will be used to measure prefrontal brain activation and functional connectivity at rest and during a working-memory task. We predict that physically active older adults will out perform less active older adults on working memory (i.e., faster, more accurate responses) and will exhibit brain activation and connectivity patterns consistent with those of younger adults during the n-back task.

Methods: Younger (18–25) and older (60+) adults completed MoCA screening, then underwent fNIRS during a 5-minute resting-state scan and an n-back (1 & 2-back) task. This study combined self-report questionnaires with heart rate derived from the fNIRS data. HbO and HbR activation was estimated from fNIRS time series using task (task > baseline) and load (2-back >1-back) contrasts across montage channels.

Results: Analyses are ongoing to test whether PA levels are associated with load-dependent fNIRS activation patterns and n-back performance across age groups.

Significance: This work will clarify how cardiovascular health and PA relate to cognitive reserve and functional connectivity in aging, and will evaluate fNIRS as an accessible tool for inclusive neuroimaging research.

Other Authors: John Anderson, Akshaya Kirithy Baskar, Mazzy Beasley, Larkin Kitsemetry

Beyond Mood: How Depressive Symptoms Shape Pragmatic Language Processing

La volonte Ndimurukundo, Carleton University

Room No: Atrium, Poster 17

14:00 – 15:00

Major Depressive Disorder (MDD) is a leading cause of disability worldwide, placing substantial burdens on individuals, healthcare systems, and society. Characterized by persistent low mood, anhedonia, and cognitive impairment, MDD is diagnosed based on symptom duration and functional impact. Beyond mood disturbances, depression significantly affects cognitive functioning, including slowed information processing, attentional deficits, and executive dysfunction. Importantly, cognitive impairments often persist even after mood symptoms improve, suggesting partially independent recovery trajectories. Understanding how depressive symptoms influence real-time cognitive processing may therefore provide critical insight into early detection and more comprehensive intervention strategies.

The present study examined whether elevated depressive symptoms are associated with differences in predictive processes fundamental to language comprehension. Specifically, we investigated whether depressive symptom severity modulates the relationship between cloze probability and N400 amplitude. Participants completed the Beck Depression Inventory-II and were categorized into high and low depressive symptom groups. EEG was recorded while participants read sentences ending in high or low cloze probability words. Pragmatic processing was indexed using the N400 event-related potential, and mean amplitudes were compared across groups and conditions. We hypothesized that the high symptom group would exhibit a reduced N400 cloze effect, reflected by a smaller amplitude difference between high and low cloze conditions, indicating weaker predictive processing. These findings may support earlier identification, more comprehensive treatment approaches, and a shift toward preventative mental health strategies.

Other Authors: Olessia Jouravlev

Alert Salience and Driver Fatigue as Predictors of Takeover Performance in Semi-Autonomous Vehicles

Tamara Mendizabal, Carleton University

Room No: Atrium, Poster 18

14:00 – 15:00

Background: As vehicles become more autonomous, the "Automation Conundrum"emerges: the more reliable a car is, the less the driver pays attention, creating "out-of-the-loop" scenarios. When a vehicle encounters a situation it cannot handle, it issues a Takeover Request. However, the transition from passive monitoring to active control is often hindered by reduced situational awareness, a low-arousal state induced by the monotony of automated driving.

Objectives: Guided by the Human-Autonomy System Oversight model, this study investigates how alert salience (low vs. high) and fatigue influence takeover performance. Specifically, it examines whether driver fatigue moderates the relationship between alert salience and the efficiency of reengaging manual control.

Methods: Using a high-fidelity driving simulator, participants engage in non-driving related tasks during nine conditionally automated driving scenarios. Driver fatigue was assessed using the Epworth Sleepiness Scale and Fatigue Severity Scale. Participants were exposed to takeover alerts varying in auditory and visual salience. Dependent variables include takeover reaction time.

Anticipated Results: It is hypothesized that high-salience alerts will yield significantly faster takeover responses than low-salience alerts. Furthermore, fatigue is expected to act as a moderator: while high-salience alerts will improve performance across all groups, they are anticipated to provide a disproportionately larger benefit ("jolt" effect) for fatigued drivers compared to alert drivers.

Conclusion: This research underscores the need for adaptive safety systems that account for the driver's mental state. By identifying how high-salience alerts can "jolt" a fatigued driver back “into the loop”, these findings can help engineers and policymakers design safer vehicles.

Other Authors: Chris Herdman, Kathleen Van Benthem

Let's play telephone! Quantifying the effect of transparency bias on language evolution using iterated learning

Aya Ameer, Carleton University

Room No: Atrium, Poster 19

14:00 – 15:00

Why do all human languages share certain features? One theory suggests that the mind's learning preferences restrict the development of language. Cultural evolution research proposes that language learners are biased toward simplicity: they pick up on simple patterns and apply them widely. In contrast, developmental linguistics claims that child learners are biased toward transparency, inferring rules that associate each word with exactly one meaning. My research will compare the theories of transparency and simplicity bias by modifying an earlier iterated learning experiment, where a chain of participants learned labels for different objects and passed them on to each other. Each object in the initial language had a unique label. Repeated transmissions resulted in a limited vocabulary, supposedly reflecting learners' simplicity bias.

The original study used one-word labels for objects that would be described by a multi-word phrase in English (e.g. "wuneho" = "red square"). Due to their knowledge of English, participants were primed to assume a 1:1 word-to-morpheme ratio, which might have led them to simplify the language at transmission. I will control for this factor with labels that include a variable number of space-separated strings ("wu ne ho"), allowing any potential transparency bias to emerge. If transparency is the dominant learning bias, the final artificial languages will include a set of words for *each* attribute (e.g., a word for each shape and one for each colour). If, instead, simplicity bias dominates learning, the languages will have a limited vocabulary that primarily captures *one* attribute (e.g., only shape).

Cognitive Control in Multilinguals and Monolinguals

Tianna Gabriel, Safi Kone, Dya Mavarani, Jada Richard, Carleton University

Room No: Atrium, Poster 21

14:00 – 15:00

Bilingualism, a prominent aspect of linguistics, has shown to enhance overall cognitive control. Although highly debated, researchers have argued that balancing two active linguistic systems enhances cognitive control processes such as executive control, inhibition and multitasking. Our study will be replicating the 2014 paper by Blumenfeld and Marian, in which they performed Stroop and Simon tasks and found that bilinguals outperformed monolinguals in the stroop task, who showed no difference across task types. This bilingual advantage shows a better stimulus-stimulus conflict control, a cognitive inhibition type prominent in bilingual processing. Other studies have also found that while bilingualism may have effects on certain executive functions, it may not enhance all executive functions. Other research has not found this to be true, finding no significant difference between bilinguals and monolinguals. Our study will investigate whether bilingualism enhances cognitive control. The two cognitive abilities tested will be stimulus-stimulus inhibition and stimulus-response inhibition. To test the theory, there will be two groups, English monolinguals and English-French bilinguals. Each participant will have their French proficiency tested through the LexTALE-Fr test. Each participant will then be asked to do two tasks, the Stroop task (tests stimulus-stimulus inhibition) and the Simon task (tests stimulus-response inhibition). All participants of this study will be undergraduate university students in Ottawa (Carleton University or University of Ottawa). We predict a bilingual advantage in cognitive control, specifically due to enhanced stimulus-stimulus inhibition skills.

Predictive Semantic Processing in Autism Spectrum Disorder: ERP Investigation of Cloze Probability Effects

Shanorah Brown, Carleton University

Room No: Atrium, Poster 22

14:00 – 15:00

Autism spectrum disorder is often associated with difficulties in linguistic and contextual processing, including challenges using sentence context to generate predictions during reading comprehension. Typically, cloze probability studies will rely on binary paradigms, which may have been too coarse to capture subtle contextual differences, particularly in autistic individuals with relatively preserved language abilities. This study will aim to investigate fine-grained, sentence-level cloze probability and its impact on N400 amplitudes during naturalistic visual sentence reading task.

For the experiment, we recruited mostly first-year undergraduate cognitive science students and assigned them to autistic or neurotypical groups based on an hour-long online survey comprising standardized measures, including the Autism Spectrum Quotient, the Kaufman Brief Intelligence Test, and a demographic questionnaire. Once classified, participants were invited to complete an in-person visual sentence-reading task while electroencephalography was recorded using a 32-channel BioSemi system with automated triggers. The task lasted approximately one hour and comprised 30 blocks of 10 sentences each. Sentence length varied, sentences were not repeated, and the final word served as the cloze probability trigger. Data collection is still ongoing.

Our primary measure is mean N400 amplitude (300–500 ms, centro-parietal sites) as a function of sentence-level cloze probability. We expect reduced N400 sensitivity to contextual constraint in autistic participants, reflecting diUerences in semantic and predictive processing. Theoretically, this study would clarify neural predictive mechanisms in autism despite preserved performance in traditional cloze probability paradigms. Practically, findings may refine contextual language assessment and intervention approaches in ASD.

Other Authors: Olessia Jouravlev

Effect of Encoding Level and Test Type on False Memories

Daisy Hagens, Taylor Moon, Olivia Schieber-Mule, Carleton University

Room No: Atrium, Poster 24

14:00 – 15:00

Memory is a vital cognitive function employed in everyday life, and as such it is necessary to understand factors that contribute to true and false memories in order to determine the reliability of memory (Schacter, 2012). Previous experiments on memory recall conclude a higher correct recall within deep processing conditions. Conversely, recall of critical lure words, words closely associated with the tested words but omitted from the list, also arose in deep-processing. Furthermore, previous research has found an increased rate of false memories in recognition tasks compared to recall tasks. The aim of our study is to replicate these findings by examining the effect of encoding depth on false memory rate, and understand the impacts of self-reference encoding and test type on false memory generation. We will implement the DRM paradigm, where participants will study semantically related word lists using either shallow (letter counting) or deep (frequency of use) encoding methods. Memory will then be assessed via free recall or recognition tests containing critical lures. False memory will be quantified as the proportion of critical lures identified relative to correct recalled/recognized items. We hypothesize an increase in false memory reported in the deep-encoding level, compared to the shallow-encoding level, as well as an increased false memory rate on the recognition test.

Bilingualism Predicts Working Memory Reserve in Older Adults: an fNIRS Study

Larkin Kitsemetry, Carleton University

Room No: Atrium, Poster 25

14:00 – 15:00

Cognitive reserve (CR) describes the brain's ability to maximize its function despite neural damage by recruiting networks previously strengthened through lifelong practices. Bilingualism is a proxy of CR that engages the frontoparietal control and salience networks involved in language control, leading to increased functional connectivity (FC) across these networks. Previous research has shown that bilinguals have greater working memory (WM) capacity than monolinguals, but the effect is far larger in older adult samples compared to young adults. This suggests that as a factor of CR, bilingualism preserves WM in older age, but it is unclear whether adaptations to FC are driving the mechanism. In this study, we used a load-varied n-back number task (1- and 2-back) and functional near-infrared spectroscopy (fNIRS), to compare WM performance as well as frontal lobe activity and FC between young and older adults, predicted by continuous measures of bilingualism from the language history questionnaire (LHQ-3). We hypothesized that the bilingual older adults' WM performance and frontoparietal activity/FC would be more similar to those of the younger adult groups than the monolingual older adults. Specifically, we expected young adults and bilingual older adults to show lateralized activity/FC within the left inferior frontal gyrus (LIFG) that would increase in the 2-back, but with less activation in the 1-back compared to monolingual older adults. Our results will highlight the role of FC in bilingual CR.

Other Authors: Leah Durham, Akshaya Kirithy Baskar, Mazzy Beasley, John Anderson

Keynote

More Alike Than Unalike: Language Learning in Monolingual and Bilingual Infants

Dr. Christopher Fennell, University of Ottawa

Room No: RB 2224

15:15 – 16:30

There has been a veritable explosion of research on bilingual infants' language development over the past twenty-five years. Unsurprisingly, differences between bilingual and monolingual language development have garnered much attention. While some differences do exist, an increasing number of studies reveal that bilingual and monolingual babies often follow the same basic path when learning language. In this talk, I will explore three key parts of early language learning: how babies find word boundaries in speech, how they learn the sounds of language, and how they begin to connect words with meaning. Looking at findings from my own research and from other laboratories, I will discuss how similar language processes can (and should) account for monolingual and bilingual language acquisition, even when outcomes differ. What may appear at first to be differences in performance between bilingual and monolingual infants often turn out to reflect shared strengths in how their cognitive systems process language.